

Solubility of n-Eicosane in Supercritical CO₂. Experimental Data and Correlation With Two EOS and an Empirical Equation

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Supercritical fluid extraction (SFE) is a technology with high potential of application: Extraction of natural products like flavors, fragrances and preservatives; oil removal from tar sands; deasphalting of heavy oils; recovery of alcohol from aqueous solutions, etc. The advantage of supercritical extraction is, among others, its selectivity to dissolve different substances depending on pressure and temperature. Solvent recovery is not necessary, because extracts are separated completely from solvent by decreasing pressure. A lot of solvents can be used in supercritical extraction processes like CO₂, methane, ethane, propane, n-hexane, propylene, water, etc

This work presents experimental solubility results of the study carried out at supercritical conditions for the system n-eicosane/CO₂ in the pressure range 10 to 20 MPa at 310, 313, 333 and 353 K. Solubility of n-eicosane in CO₂ has a clear functionality with pressure and temperature. The hydrocarbon solubility decreases as temperature decreases, and increases as pressure increases. The experimental studies were carried out in a flow apparatus constructed in our laboratory. The extracted solute was determined gravimetrically. The system pressure was measured to ± 2 kPa, temperature was measured to ± 0.05 K and the concentration was determined to ± 0.0002 mole fraction. The solubility results were correlated with two equations of state (EOS) and with the Chrastil equation. The EOS were Peng-Robinson-Stryjek-Vera (PRSV) and Redlich-Kwong-Soave-Mathias (RKSM). Both EOS and Chrastil equation correlated reasonably well the experimental data.